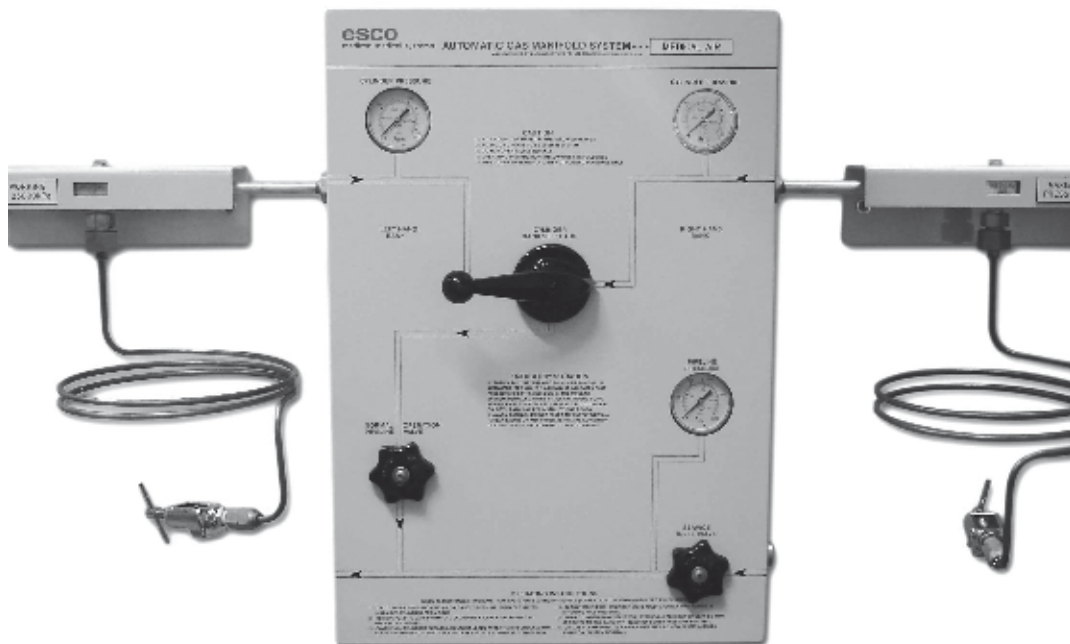


esco

m e d i c o n

AUTOMATIC GAS MANIFOLDS INSTALLATION, OPERATION & MAINTENANCE MANUAL



ALL ESCO AUTOMATIC GAS MANIFOLDS COMPLY WITH THE
OPERATIONAL & SAFETY REQUIREMENTS OF AUSTRALIAN
STANDARD AS2896-1998



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1. Introduction

Esco Automatic Gas Manifold (AGM) systems are designed to supply hospital facilities with Oxygen, Nitrous Oxide, Medical Air and Surgical Tool Air, meeting the requirements of AS2896.

The concept consists of a central control panel with regulators, changeover mechanism, pressure switches, gauges, shut off valves and service inlet facility, all mounted and piped on one easily installed base plate. A screen printed cover illustrating the operation is fitted over the assembly.

After factory assembly, the regulators, pressure switches and relief valves are set and tested prior to despatch as per setting instructions in this manual. No adjustments should be necessary after installation, however, if for some reason the AGM is not performing as per specification, please contact ESCO Industries on (02) 8799 3700.

2. Specifications

MAXIMUM INLET (Cylinder) PRESSURE 23,000KPa

OUTLET (Line) PRESSURES

(a) Oxygen, Medical Air & Nitrous Oxide 450KPa

(b) Surgical Tool Air 750 & 1,450KPa

OUTLET CONNECTION Male 5/8" SAE Flare

EMERGENCY INLET CONNECTION Sleeve Index,
Gas specific as per AS2896 Terminal Units

HEADER BLOCK CONNECTIONS

Nitrous Oxide	M16 x 1.5
Oxygen	M18 x 1.5
Air	M20 x 1.5
Surgical Tool Air	M20 x 1.5

3-Installation

1. The cylinder size chosen will determine the mounting height of the manifold control panel. "G" size cylinders are normally used, however, we suggest you check before commencing installation.
2. If "G" size cylinders are to be used, mark the wall at 1800mm above the finished floor level. Temporarily connect a cylinder lead and header block assembly together. Position the header block with bracket fixing holes over the 1800mm mark and confirm cylinder connection height (1460mm) is correct to drawing 32267. Cylinder Lead assemblies are designed to flex vertically approximately 50mm, accounting for slight variations in cylinders.

If correct, remove screen printed cover from the central control panel by removing:

- a) Black selector lever.
- b) Two black valve hand wheels.
- c) Two M5 button head screws at bottom.

Then proceed and fix the base plate to wall (M6 Dynabolts) to drawing 32267, spot drilling through slots & holes.

3. Header Blocks and brackets are supplied assembled, however, you must attach these to the central control panel high pressure blocks (right and left hand) using two header block connection tube assemblies (Z02J008) - refer to drawing 32289. This will position the header block brackets correctly on either side of the central control panel. Lastly, position and fix cylinder racks as per drawing 32267.

Pipeline Connection:

1. The pipeline is connected to the central control panel at the bottom left hand corner via the 5/8" SAE flare tee fitting. The 5/8" Dia. Copper pipeline may exit the unit either horizontally (as supplied) or vertically, simply by rotating the tee fitting through 90° clockwise. A 5/8" SAE flare to 3/4" diameter outlet bend assembly (Item 59 Dwg 32503) is supplied allowing initial pipework connection with 3/4" copper tube.

4. Operation

High pressure gas (up to 230 bar) is supplied from both banks of cylinders into the manifold as indicated by the two pressure gauges in the top right and left hand corners of the panel.

The "Cylinder Bank Selector" in the centre of the panel determines which bank of cylinders, left or right hand, is the primary bank and which is the secondary. The primary bank will always be the one feeding the system until such time as the pressure in these cylinders drops below;

700KPa (4 Bar) - Oxygen, Air & Nitrous Oxide, or

1200KPa (7 Bar) - Surgical Tool Air, or

1600KPa (14 Bar) - Surgical Tool Air,

at which time the secondary bank will automatically take over and continue to feed the system. (At this point the pressure switch in the top left hand corner will open, signalling any remote monitor that empty cylinders require changing).

In the normal course of operation, the "Primary Bank" designation will alternate back and forth between left and right banks, if the operating instructions printed on the front panel are followed.

Safety Precautions:

A shuttle valve is built into the tee just before the low pressure regulator, to ensure back pressure does not affect the high pressure regulators during operation. As one regulator is in use, the valve shuts off the opposite regulator from the feed back.

In addition, two pressure relief valves, in parallel, monitor the line pressure to ensure a regulator malfunction does not over-pressure the hospital pipeline system. These relief valves can be removed (cover removal necessary) one at a time for testing, if required. A self sealing valve will prevent loss of gas during removal.

Low Pressure Alarm:

The pressure switch on the top right hand side of the central control panel is set to operate at a pressure approx. 25% lower than the set pipeline pressure and in turn will signal any remotely connected alarm panel.

5. Service

1. Every six (6) months the manifold system should be inspected / tested for leaks and malfunctions as follows:
 - a) Test regulators for external leaks and correct pressure reduction.
 - b) Test all pipe connections for leaks.
 - c) Test the system failure pressure switch (right hand switch) for correct setting and operation.
 - d) Test non return valves in header block nipples for proper closure. **Note:** these valves do not seal completely. Inspect cylinder extension leads for flexibility, metal fatigue and thread damage at cylinder connections. **Note:** any damaged leads should be replaced immediately.
 - e)

2. For high usage manifolds, we suggest that all three (3) regulators be serviced on a twelve (12) monthly basis. Other manifold service intervals can be extended to suit use. As diaphragm and seat replacement require special tools and test equipment, it is recommended that for service, the entire three regulator unit be removed as a whole and replaced with a changeover unit available from ESCO Industries. (You are invoiced for the exchange unit and credited upon receipt of your used unit).

The part numbers for exchange regulator sets are as follows:

- a) AGM3RS-O-A-NO Automatic Gas Manifold Three Regulator Set - Oxygen, Air or Nitrous Oxide (4 Bar)
- b) AGM3RS-ST Automatic Gas Manifold Three Regulator Set - Surgical Tool Air (14 Bar)

Please phone Esco Industries for other outlet pressures and for current changeover prices on (02) 8799 3700.

As a guide, usage rates can be qualified as follows:

- a) Low Usage: Up to 4 "G" size cylinders per week.
- b) Medium Usage: From 4 to 20 "G" size cylinders per week.
- c) High Usage: More than 20 "G" size cylinders per week.

Regulator Section Replacement:

Before commencing a regulator section changeover, it is recommended that a time with minimal demand of gas be chosen and that the appropriate nursing staff be briefed as remote alarm panels may indicate low pressures and cylinders needing replacement. To remove the three regulator assembly as a whole, proceed as follows:

1. Remove black selector lever, valve hand wheels and cover.
2. Replace valve hand wheels and selector lever.
3. Connect service supply at inlet facility (bottom right hand corner).
4. Ensure service inlet valve is closed, turn on gas cylinder and set service regulator to pipeline pressure, 450KPa for Oxygen, Air or Nitrous Oxide, 750 or 1450KPa for Surgical Tool Air.
5. Close normal operation pipeline valve and open service inlet valve. The hospital is now running on the service supply.
6. Turn off all bottles (left and right hand banks).
7. Loosen 5/8" flare nut on left hand side of centrally mounted low pressure regulator to exhaust gas from selected side of system.
Note: At this point, gas alarm panel(s) will indicate supply failure (red light flashing).
8. Disconnect lower 1/4" flare nut on left hand pressure switch.
9. Remove the four M6 pan head screws fixing the central changeover mechanism to the base plate. The regulator and changeover mechanism assembly can now be removed by disconnecting the two high pressure inlet stem nuts (28mm hex.) From the left and right hand high pressure inlet blocks, items Z02C089 and Z02C146, drawing No 32503.

10. Place assembly on bench.
11. As mentioned earlier, we recommend that you arrange a changeover three regulator unit with us. If you choose to make other arrangements, diaphragm and seat kits are available from the Harris National spare parts distributor:-

OXY REPAIR
Unit 1 No 5 Lear Jet Drive
Caboolture QLD 4510

Phone: (07) 5499 1999
Fax: (07) 5499 3666

12. Reassemble in the reverse of the described disassembly procedure, however, it may be necessary to adjust the left and right hand pressure blocks Z02C089, Z02C146 (drawing No 32503) and high pressure header blocks Z02C145 (drawing No 32289) to suit the three regulator unit. During service, the regulator inlet stem centre distance may have changed.
13. If you have installed an exchange three regulator set, the following setting procedures should not be necessary. The regulator sets are preset and pressure tested prior to despatch.
14. After reassembly is complete, it will be necessary to check the regulator output pressures as per setting instructions in this manual. **Note:** Item 4. In setting instructions requests you to bleed some gas from the pipeline system. On this occasion you cannot use the service inlet, so loosen the 5/8" flare nut on left hand side of centrally mounted low pressure (pipeline) regulator.
15. Setting of the low pressure regulator can only be done approximately at this stage, as the pipeline pressure gauge is in use on the service system during maintenance. Set the regulator adjusting screw so it protrudes below its lock nut (Z02C182), the same distance as the previously removed regulator screw.
16. At this point, the system is ready to be reconnected to the hospital pipeline. Isolate the service system and open the normal pipeline valve.

17. Reset the low pressure regulator now using pipeline pressure gauge, to 450KPa for Oxygen, Air and Nitrous Oxide, 750 or 1450KPa for Surgical Tool Air.
18. Replace cover.

6. Spare Parts

For information and availability of all Esco spare parts, please consult drawings 32503, 32287 and 32289, then call us on (02) 8799 3700 or fax us on (02) 8799 3710.

7. Setting Instructions

1. Setting Instructions For 4 Bar Oxygen, Medical Air & Nitrous Oxide Units:

- a) Remove valve hand wheels, selector lever and cover from manifold unit, replace selector lever and check both valves are closed.
- b) Connect up full gas cylinders on both sides of manifold.
- c) Turn on cylinder valves on left bank, check cylinders are full by reading gauge on top left hand side. Cylinder valves on right bank must be off - select left bank with lever on auto manifold.
- d) Bleed off some gas from the pipeline system and read pressure on centre gauge. (**Note:** Service inlet valve can be used to bleed gas).
- e) Gauge should read 900KPa + 10KPa, if incorrect, adjust plunger screw Z01C005 DRG 32287 on left hand side of changeover lever cam and tighten lock nut (8mm open end spanners required).
- f) Set right hand pressure regulator to 900KPa + 10KPa in the same way as the left hand regulator making sure that some gas is bled off the system before each time a reading is taken and that the left hand bank is turned off and the right hand bank is selected with the lever.
- g) To check the lower pressure setting, select left hand bank with lever on manifold with cylinder valves on left hand bank off and cylinders on right hand bank on. Bleed some gas from the pipeline system and read the pressure on the centre gauge. This reading should be approx. 700KPa. Repeat this procedure with the right hand bank selected, right hand bank off and left hand bank on. A similar reading of 700KPa should be obtained. (**Note:** this differential pressure is factory set and cannot be adjusted in the field).

- h) Now that the high pressure regulators are set, the changeover pressure switch on top left hand side of panel should be set to operate at 800KPa. To check the setting, pressurise system and with multimeter probes on the terminal block, bleed slowly & watch meter for operation whilst checking actual switching pressure on intermediate (central) gauge. Adjustment is made with a screw in between the two spade terminals.

NOTE: To increase setting, screw down (clockwise). To decrease, screw anticlockwise. If adjustment is required, switch cover removal is necessary. There is no differential setting on Suco Pressure Switches.

- i) The dual line pressure safety valves at bottom centre of panel are set to begin exhausting between 530 and 575KPa and be at full flow at 820KPa.
- j) The centrally mounted pipeline regulator may now be set at approx. 450KPa (this will allow for a 410KPa pressure at outlets with some line pressure drop).
- k) The system failure pressure switch on the top right side of panel should be set at 300KPa. To check the setting, proceed as described in (h), whilst checking actual switching pressure on bottom right hand side, line pressure gauge.

Note: All models of Esco "MSSD" system status display units utilise opening contacts (ie. fail safe) on pressure switches to initiate alarms. The pressure switches fitted in Esco Automatic Gas Manifolds, AGM's operate in this manner.

2. Setting Instructions For 7 Bar Surgical Tool units:

- a) Remove valve hand wheels, selector lever and cover from manifold unit, replace selector lever and check both valves are closed.
- b) Connect up full gas cylinders on both sides of manifold.
- c) Turn on cylinder valves on left bank, check cylinders are full by reading gauge on top left hand side. Cylinder valves on right bank must be off - select left bank with lever on auto manifold.
- d) Bleed off some gas from the pipeline system and read pressure on centre gauge. (**Note:** Service inlet valve can be used to bleed gas).
- e) Gauge should read 1500KPa + 10KPa, if incorrect, adjust plunger screw Z01C005 DRG 32287 on left hand side of changeover lever cam and tighten lock nut (8mm open end spanners required).
- f) Set right hand pressure regulator to 1500KPa + 10KPa in the same way as the left hand regulator making sure that some gas is bled off the system before each time a reading is taken and that the left hand bank is turned off and the right hand bank is selected with the lever.
- g) To check the lower pressure setting, select left hand bank with lever on manifold with cylinder valves on left hand bank off and cylinders on right hand bank on. Bleed some gas from the pipeline system and read the pressure on the centre gauge. This reading should be approx. 1200KPa. Repeat this procedure with the right hand bank selected, right hand bank off and left hand bank on. A similar reading of 1200KPa should be obtained. (**Note:** this differential pressure is factory set and cannot be adjusted in the field).

- h) Now that the high pressure regulators are set, the changeover pressure switch on top left hand side of panel should be set to operate at 1350KPa. To check the setting, pressurise system and with multimeter probes on the terminal block, bleed slowly & watch meter for operation whilst checking actual switching pressure on intermediate (central) gauge. Adjustment is made with a screw in between the two spade terminals.

NOTE: To increase setting, screw down (clockwise). To decrease, screw anticlockwise. If adjustment is required, switch cover removal is necessary. There is no differential setting on Suco Pressure Switches.

- i) The dual line pressure safety valves at bottom centre of panel are set to begin exhausting between 910 and 980KPa and be at full flow at 1400KPa.
- j) The centrally mounted pipeline regulator may now be set at approx. 750KPa (this will allow for a 700KPa pressure at outlets with some line pressure drop).
- k) The system failure pressure switch on the top right side of panel should be set at 550KPa. To check the setting, proceed as described in (h), whilst checking actual switching pressure on bottom right hand side, line pressure gauge.

Note: All models of Esco "MSSD" system status display units utilise opening contacts (ie. fail safe) on pressure switches to initiate alarms. The pressure switches fitted in Esco Automatic Gas Manifolds, AGM's operate in this manner.

3. Setting Instructions For 14 Bar Surgical Tool units:

- a) Remove valve hand wheels, selector lever and cover from manifold console, then replace selector lever and valve hand wheels, check both valves are closed.
- b) Connect up full gas cylinders on both sides.
- c) On 14 Bar manifolds, the lower (reserve) regulator pressure settings are set accurately first. To check the lower pressure setting, select left bank with lever on manifold with cylinder valves on left bank off and cylinders on right bank on. Check cylinder is full by reading gauge on top right hand side.
- d) Bleed off some gas from the system.
(**Note:** Service inlet valve can be used to bleed gas).
- e) Read the pressure on the centre gauge. This reading should be 1600 kPa. If incorrect, adjust plunger screw Z01C005 on DRG 32287 on right hand side of changeover lever cam and tighten lock nut (8mm open end spanners required).
- f) Set left hand pressure regulator to 1600 KPa in the same way as the right hand regulator making sure that some gas is bled off the system before each time a reading is taken and the left hand bank is turned on, left hand cylinder full, right hand bank off and the right hand bank is selected with the lever. The same reading of 1600kPa should be obtained.
- g) To check the higher pressure setting, select left hand bank with lever on manifold. The central gauge should rise to approximately 2150 kPa - 50 kPa. Repeat this procedure with the right hand bank selected, right hand bank on and left hand bank off. Bleed some gas and a similar reading of 2150 kPa - 50 kPa should be obtained. **Note: this** differential pressure is controlled by the camshaft throw and cannot be adjusted in the field.

- h) Now that the high pressure regulators are set, the changeover pressure switch on top left hand side of panel should be set to operate at 1650KPa. To check this setting, select the left hand bank with left hand off and right hand bank on. With multimeter probes on the terminal block, bleed slowly & watch meter for operation whilst checking actual switching pressure on the central gauge. Adjustment is made with the screw in between the two spade terminals.

NOTE: To increase setting, screw down (clockwise). To decrease, screw anticlockwise. If adjustment is required, switch cover removal is necessary. There is no differential setting on Suco Pressure Switches.

- i) The dual line pressure safety valves at bottom centre of panel are set to begin exhausting between 1690 and 1820KPa and be at full flow at 2600KPa.
- j) The centrally mounted pipeline regulator may now be set at approx. 1450KPa (this will allow for a 1400KPa pressure at outlets with some line pressure drop).
- k) The system failure pressure switch on the top right side of panel should be set at 1000KPa. To check this setting, isolate switch with valve adjacent to the bottom right hand side line pressure gauge. With multimeter probes on switch terminal block, bleed slowly by loosening flare nut below switch. Watch meter for operation whilst checking actual switching pressure on line pressure gauge.

Note: All models of Esco "MSSD" system status display units utilise opening contacts (ie. fail safe) on pressure switches to initiate alarms. The pressure switches fitted in Esco Automatic Gas Manifolds, AGM's operate in this manner.

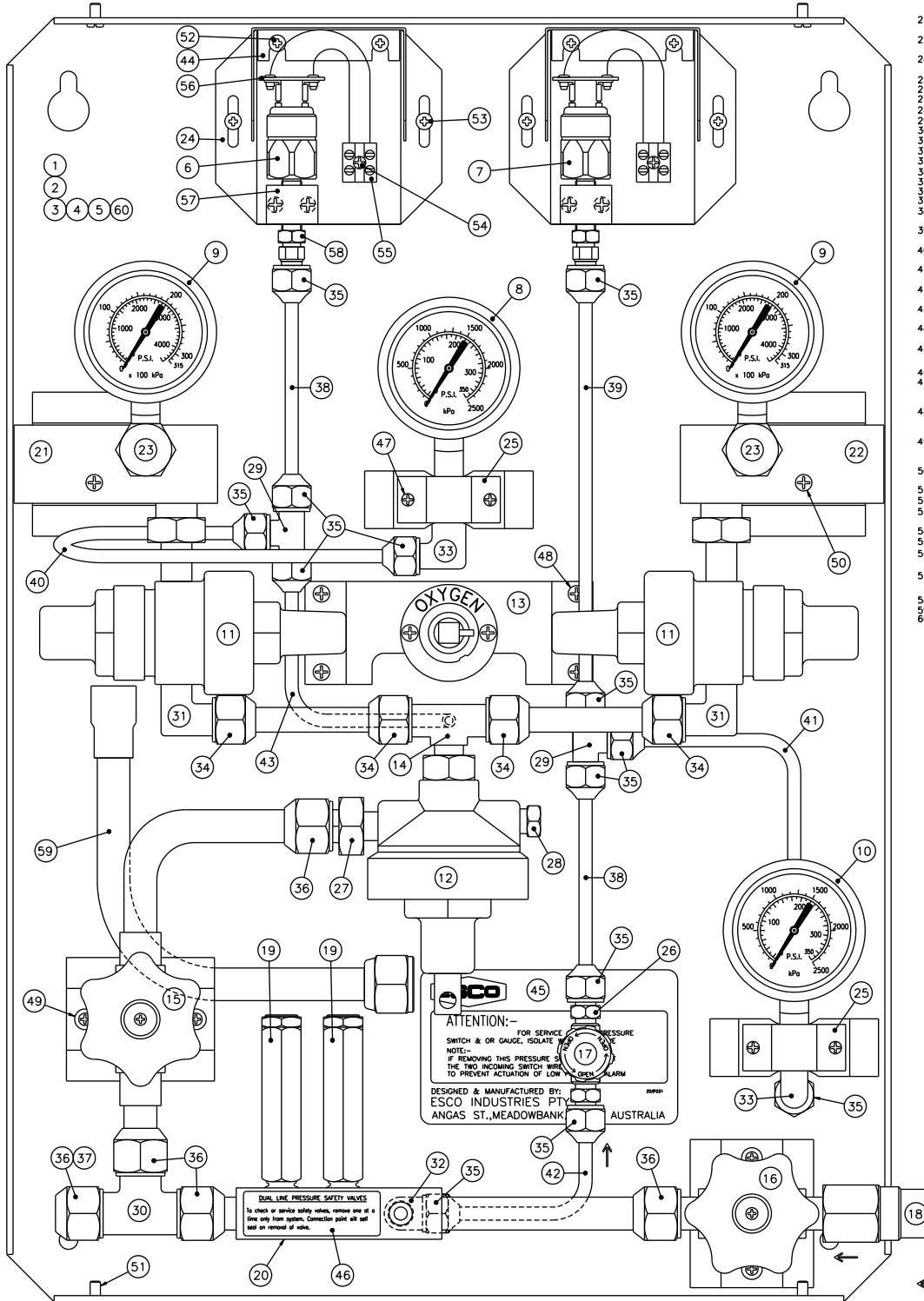
1. BASE PLATE ASSEMBLY (Z28D027)
2. MANIFOLD COVER (Z15D217)
3. LABEL - MEDICAL AIR (Z03F033)
4. LABEL - NITROUS OXIDE (Z03F034)
5. LABEL - SURGICAL TOOLS (Z03F035)
6. CHANGE OVER PRESSURE SUICO SWITCH (Z06C001), FOR TOOL AIR (Z06C005)
7. SYSTEM FAIL PRESSURE SUICO SWITCH (Z06C001)
8. INTERMEDIATE PRESSURE GAUGE (Z29A013) FOR TOOL AIR (Z29A014)

9. HIGH PRESSURE GAUGE (Z29A012)
10. LOW PRESSURE GAUGE (Z29A013) FOR TOOL AIR (Z29A014)
11. HIGH PRESSURE REGULATOR (Z29B037) FOR OXYGEN, AIR, NITROUS OXIDE (Z29B047) ^D
12. LOW PRESSURE REGULATOR (Z29B035)
13. HIGH PRESSURE REGULATOR CHANGE OVER MECHANISM

14. SHUTTLE VALVE ASSEMBLY (Z29B005)
15. MAIN LINE VALVE ASSEMBLY (Z29B011) COMES COMPLETE WITH COPPER PIPES AND FLARE NUTS SPECIAL WASHER UNDER HANDLE FIXING SCREW (Z15D223)
16. LINE VALVE HELDON (Z29B012) SPECIAL WASHER UNDER HANDLE FIXING SCREW (Z15D223)
17. NEEDLE VALVE (Z29B013)

18. SERVICE INLET ASSEMBLY
THREADED NIPPLE (Z02C166)
COPPER FLARE WASHER (Z17D001)
SERVICE INLET BODY (Z02C256)
"O" RING (Z17B006)
LOCATION SLEEVE
OXYGEN (Z02C162)
AIR (Z02C161)
NITROUS OXIDE (Z02C163)
SURGICAL TOOLS (Z02C164)
CARBON DIOXIDE (Z02C231)

19. LOW PRESSURE RELIEF VALVE ASSEMBLY
VALVE BODY (Z02C048)
LOCK NUT (Z02C073)
ADJUSTING SCREW (Z02C070)
RELIEF VALVE (Z02C076)
SCREW CONNECT NIPPLE (Z02C210)
THREADED NIPPLE (Z02C166)
MAIN VALVE (Z02C167)
RELIEF VALVE SPRING (Z25A008)
COMPRESSION SPRING (Z25A002)
RELIEF VALVE SEAL (Z02F075)
"O" RING (Z17B001)
"O" RING (Z17B008)
20. LOW PRESSURE TAKE OFF BLOCK ASSEMBLY (Z02J018)
21. LEFT HAND HIGH PRESSURE BLOCK (Z02C146)
22. RIGHT HAND HIGH PRESSURE BLOCK (Z02C089)
23. HIGH PRESSURE GAUGE ELBOW (Z02C116)
24. SUICO SWITCH MOUNTING BRACKET (Z15E153)
25. GAUGE SADDLE CLAMP (Z15D222)
26. UNION (Z29C018)
27. UNION (Z29C023)
28. PLUG (Z29C021)
29. TEE (Z29C028)
30. TEE (Z29C024)
31. ELBOW (Z29C019)
32. ELBOW (Z29C020)
33. ELBOW (Z29C025)
34. FLARE NUT (Z29C016)
35. FLARE NUT (Z29C027)
36. FLARE NUT (Z29C014)
37. BLANKING DISC (Z15D231)
38. LINE PRESSURE SWITCH/COCK EXIT TUBE ASSEMBLY (Z28D009)
39. LINE PRESSURE SWITCH TUBE ASSEMBLY (Z28D009)
40. INTERMEDIATE PRESSURE GAUGE TUBE ASSEMBLY (Z28D010)
41. LINE PRESSURE GAUGE TUBE ASSEMBLY (Z28D008)
42. COCK FEED TUBE ASSEMBLY (Z28D012)
43. CHANGE OVER PRESSURE SWITCH FEED TUBE ASSEMBLY (Z26D021)
44. SUICO SWITCH COVER (Z15E154)
45. LABEL "GAUGE (ISOLATING VALVE" (Z03A032)
46. LABEL "SAFETY VALVE" (Z03A014)
47. SCREW (Z01A238) WITH SHAKE- PROOF WASHER (Z01D021)
48. SCREW (Z01A140) WITH SHAKE- PROOF WASHER (Z01D049)
49. SCREW (Z01A004) WITH NYLOC NUT (Z01B011) & FLAT WASHER (Z01D059)
50. SCREW (Z01A254) WITH NYLOC NUT (Z01B011)
51. SCREW (2) (Z01A327)
52. SCREW (Z01A268)
53. SCREW (Z01A241) & FLAT WASH (Z01D002)
54. SCREW (Z01A234)
55. TERMINAL BLOCK (Z05A028)
56. PRINTED CIRCUIT BOARD (Z12D008)
57. SUICO SWITCH MOUNTING BLOCK (Z02C025)
58. UNION (Z29C048)
59. OUTLET BEND ASSEMBLY (Z28E147)
60. LABEL - CARBON DIOXIDE (Z03F043)



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DATE: 29/07/04
DRAWN BY: B.P.
SHEET NO: 1 of 1

ESCO MEDICAL GAS.

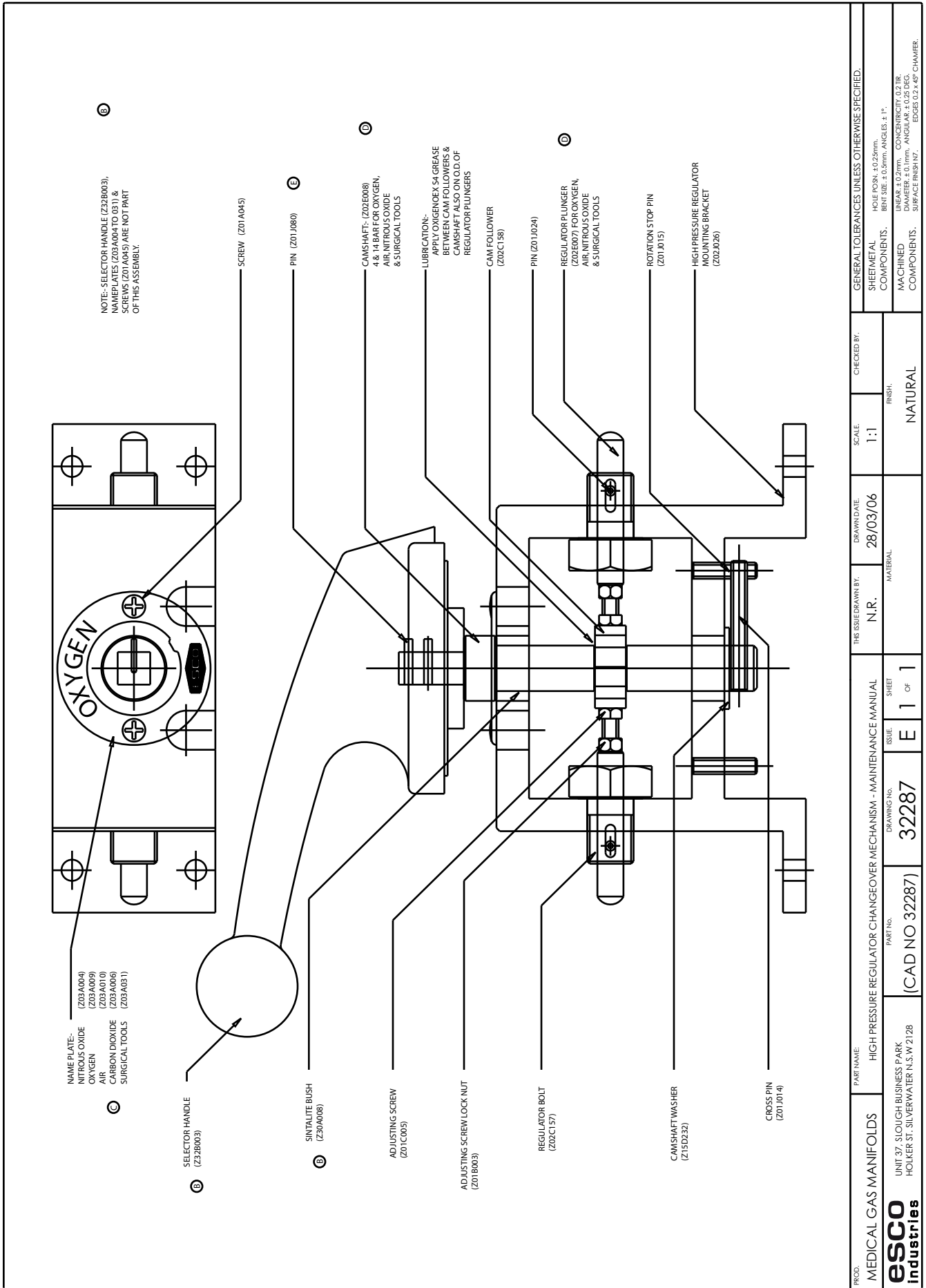
AUTOMATIC GAS MANIFOLD CENTRAL CONTROL PANEL.
CUSTOMER DRAWING

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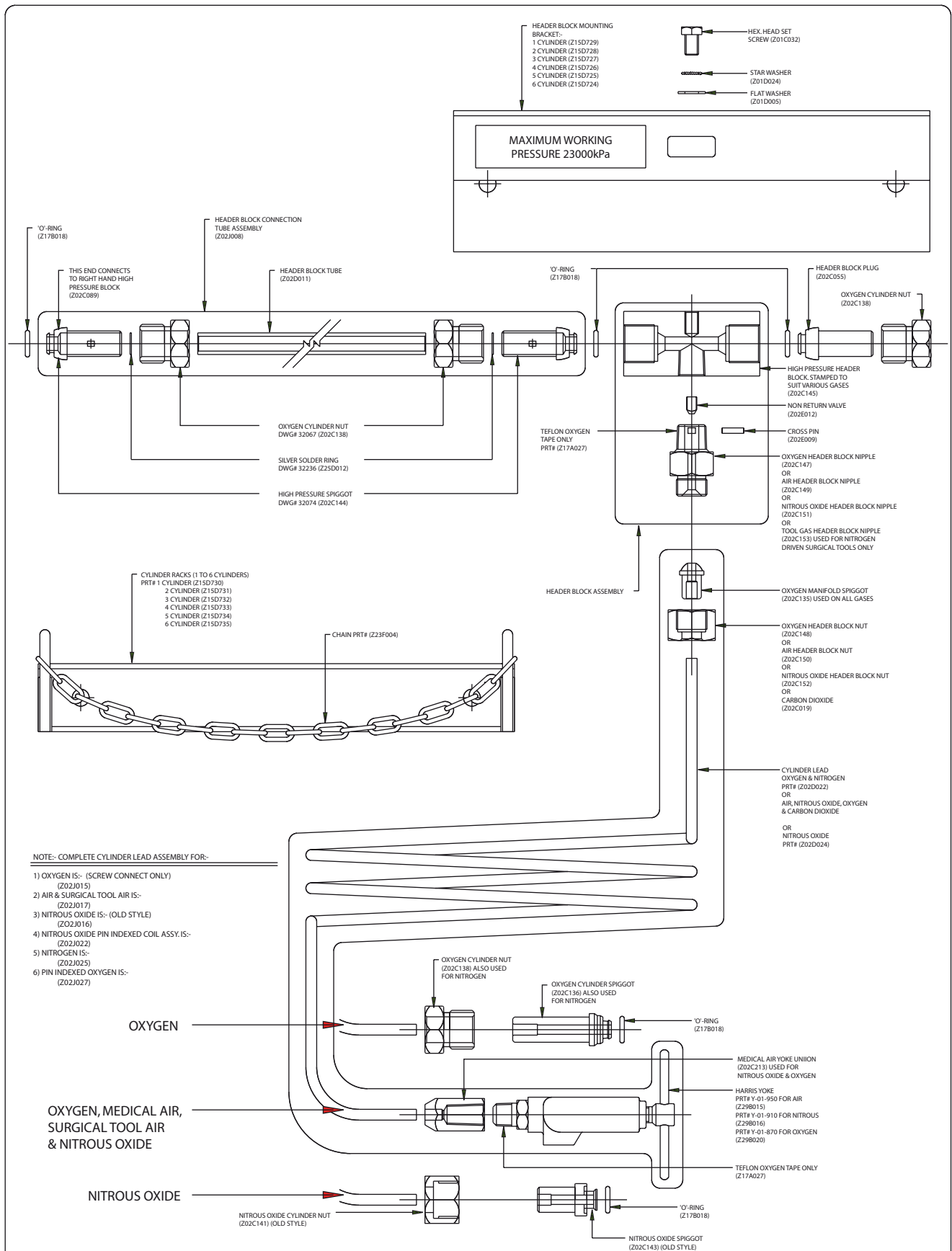
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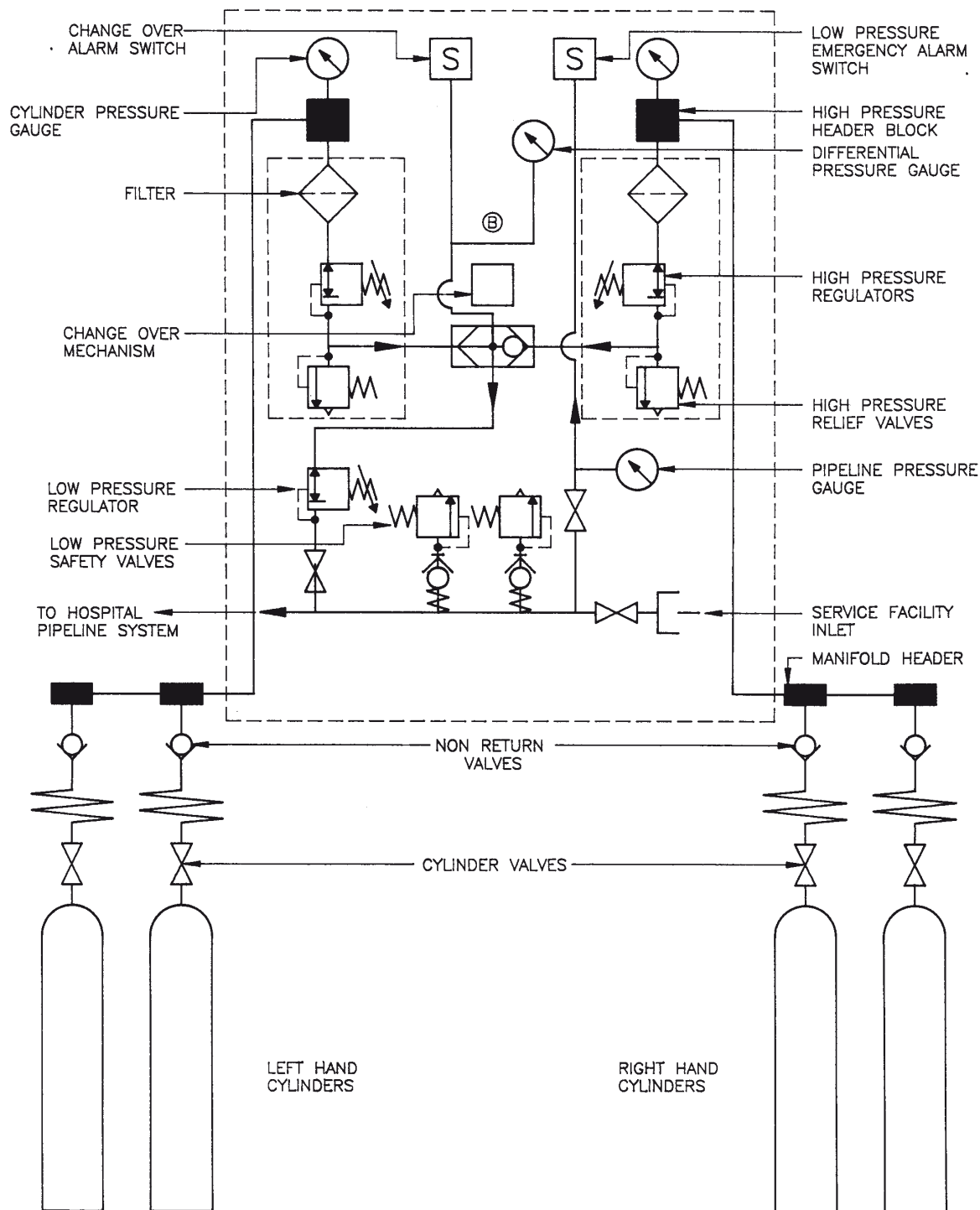
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PROD: MEDICAL GAS MANIFOLDS esco industries	PART NAME: HIGH PRESSURE REGULATOR CHANGEOVER MECHANISM - MAINTENANCE MANUAL	DRAWING NO: 32287 (CAD NO 32287)	ISSUE: E 1 OF 1	SHEET 1	MATERIAL NATURAL	FINISH: NATURAL	CHECKED BY: N.R.	SCALE: 1:1	DRAWN DATE: 28/03/06	GENERAL TOLERANCES UNLESS OTHERWISE SPECIFIED:	
										SHEET METAL COMPONENTS: HOLE POSN. $\pm 0.25\text{mm}$ BENT SIZE $\pm 0.5\text{mm}$ ANGLES $\pm 1^\circ$	
										MACHINED COMPONENTS: LINEAR $\pm 0.2\text{mm}$ CONCENTRICITY 0.2IR DIAMETER $\pm 0.1\text{mm}$ ANGULAR $\pm 0.25\text{ DEG}$ SURFACE FINISH Rz EDGES $0.2 \times 45^\circ$ CHAMFER	

AUTOMATIC GAS MANIFOLDS





ESCO MEDICAL GAS.

DATE: 8/12/92

SCHEMATIC DIAGRAM OF AUTOMATIC GAS MANIFOLD.

DRAWN BY: C.D.B.



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DRAWING No: 32271

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